

THURSDAY, APRIL 10, 1913.

THE HERITABLE RESULTS OF CHANGED NURTURE.

Das Problem der Vererbung "erworbener Eigenschaften." By R. Semon. Pp. viii+203. (Leipzig: Wilhelm Engelmann, 1912.) Price 3.20 marks.

RETURNING to the much-discussed question of the transmission of acquired characters, Prof. Richard Semon goes over the whole ground. Conclusions—both affirmative and negative—have been based on certain sets of data, but all the facts must be faced if we are to form a sound judgment. This is indeed what many biologists have tried to do. The first chapter, which is historical, includes the commendable suggestion that it is time to stop using inexact terms like "Lamarckism," so often taken as synonymous with the theory of the transmission of acquired modifications. In the second chapter the author formulates the question at issue: A stimulus sets up an excitation in a parental body; the residual effect of this excitation is a change in the reaction-capacity (an "Engramm"); can we say that in favourable circumstances there results a change in the hereditary potency of the germ-cells, and of such a nature that the offspring show a change in the same direction as that exhibited in the parent?

Prof. Semon begins his survey of the evidence by considering language, acquired knowledge, and training; and while he does not claim to prove anything, he refers to cases which suggest that individual experience must count somehow. Why is it, for instance, that a young buzzard, taken from the nest, treats an adder quite differently from a grass-snake? Has experience not counted at all in the evolution of this inborn power of discrimination? The fourth chapter brings together numerous interesting cases which suggest the inheritance of engramms. Young acacias with an "inherited disposition" to a certain rhythm of sleeping and waking will, as it were, try to give expression to this in quite unnatural conditions of illumination and darkness. Braus has shown that if the fore-limb be removed from the larva of a Bombinator, the operculum still shows the thin area, usually with a small hole, through which the limb would press out if it were there. Is this not a reminiscence of a previously established "mechanomorphosis"? The degeneration of the eyes of cave animals, considered in detail and in connection with Kammerer's experiments on *Proteus*, point to a hereditary accumulation of the structural results of disuse and darkness. In

regard to this and similar cases it appears to us to remain a question of interpretation. Which reading of the facts presents least difficulty?

Prof. Semon does not think that we should give up expecting a specific hereditary result of often-repeated injuries, and he refers, for instance, to Kammerer's experiment on the Ascidian, *Ciona intestinalis*, the siphons of which were cut off over and over again. In consequence of the stimulus, the length of the regenerated siphons was excessive, and the uninjured offspring had also excessively elongated siphons. We must, of course, hear more about this interesting case. The sixth chapter marshals the positive evidence which goes to show that parents much modified by peculiarities of nurture may have offspring changed in the same direction, although the peculiar nurture is no longer operative. The evidence includes recent observations on the acclimatisation of plants, Woltereck's experiments on the helmet of *Daphnia*, and Kammerer's striking work on salamanders and the nurse-frog.

The question then arises: How are the germ-cells affected? Prof. Tower was led by his well-known experiments on potato-beetles to the view that the environmental factors operated on the germ-cells without any induction from the unchanged soma of the parent. But Prof. Semon points out that an adult beetle could not be expected to show much external change, and argues that there is no escape from a theory of somatic induction, the various possible modes of which are carefully and acutely discussed. The author concludes that long-continued functional modifications may by somatic induction exert a specific effect on the germ-cells, and that certain environmental stimuli may also affect the germ-cells by somatic induction. The results depend on three variables: the nature, strength, and duration of the excitations, the general constitution of the organism, and the state of the germ-cells—susceptible or otherwise—at the time. Prof. Semon's latest presentation of the case for the heritability of somatogenic changes is a valuable contribution to ætiology, and one that must be reckoned with by all biologists. The book is written with force and clearness and in admirable scientific temper.

J. A. T.

THE WORK OF G. VON REICHENBACH.

Deutsches Museum Lebensbeschreibungen und Urkunden. Georg von Reichenbach. By Walther v. Dyck. Pp. iii+140+vihi plates. (Munich: Deutsches Museum, 1912.)

DURING the last eight or nine years an extremely instructive and valuable collection illustrating the various sections of science and

technology has been accumulated at the Deutsches Museum in Munich, and in 1910 the committee of direction decided to publish a series of biographies of men whose work has had a special bearing on these subjects. The first volume to appear deals with the life and work of Georg von Reichenbach, to whom many advances, not only in the construction of astronomical and surveying instruments, but also in engineering, were due. Born in 1771, his education was carried on not only in school, but also in the workshop with his father, where he showed remarkable mechanical aptitude. At the age of twenty he was sent to England to study mechanical engineering, and in the works of Boulton and Watts in Soho he spent some months working at engine construction. While in England he had not had an opportunity of seeing the works of the leading instrument makers, but availed himself of every opportunity to study this industry also. Ramsden, Troughton, Dollond, Cary and others then supplied the greater part of Europe with instruments of the highest grade, but on his return to Munich he founded workshops for constructing instruments of precision, and for accurately dividing circles.

In the latter part of the eighteenth century a large amount of surveying was done, and in 1801 a base-line 21.7 km. long was measured near Munich for the systematic survey of Bavaria, so that von Reichenbach found his opportunity. The work of Laplace, Gauss, Bessel and others introduced a great increase in the precision aimed at and attained, and Reichenbach successfully constructed theodolites for the Bavarian survey with circles up to twelve inches in diameter; he was acquainted with Ramsden's great 36-in. theodolite which was constructed for General Roy, but apparently preferred the smaller instrument.

Throughout his work Reichenbach adhered to the vernier in preference to the micrometer microscope for astronomical as well as for geodetic instruments on the ground that with the former the portion of the circle was directly measured, while the micrometer measured the enlarged figure of the divisions. The circle of his 12-in. theodolite for the Bavarian survey was divided to five minutes and was read by a vernier to four seconds and by estimation to two. The triangulation of northern Bavaria called for the construction of a base-measuring apparatus, and in 1807 von Reichenbach constructed one consisting of iron 4-metre bars to be placed almost in contact, the interval being measured by a thin graduated wedge.

Large astronomical instruments were also constructed for Naples, Genoa, Turin, Mannheim and elsewhere, and are described as

being among the best of that time. A very fine range of instruments, both astronomical and geodetic, is included in the collections of the Deutsches Museum. But, as Gauss remarked in a letter written to Bessel from Munich, the construction of astronomical instruments was not von Reichenbach's principal occupation.

Engineering machinery took up more of his time and attention, and in 1808 he constructed water-pressure pumping engines for the salt-works of Riechenhall and Traunstein, and others of improved design were built, and one of these, at Ilsauk, is still working. Iron-bridge construction and steam-engine design and construction also engaged his attention, and in many spheres of activity von Reichenbach showed remarkable originality and brilliant capacity. His family has presented to the Deutsches Museum a large collection of writings, drawings and plans, which have been extensively utilised in the present monograph, wherein Dr. W. von Dyck has produced not only a highly interesting account of a man of exceptional ability and resource, but has also rendered available a large collection of valuable and important documents relating to the construction of instruments of precision and of machinery, and some of these are reproduced in the plates which illustrate the monograph.

PURE AND APPLIED CHEMISTRY.

- (1) *Chemistry of the Oil Industries*. By J. E. Southcombe. Pp. ix+204. (London: Constable and Company, Ltd., 1913.) Price 7s. 6d.
- (2) *Achievements of Chemical Science*. By Dr. J. C. Philip. Pp. vii+217. (London: Macmillan and Co., Ltd., 1913.) Price 1s. 6d.
- (3) *Le Celluloïd et ses Succédanés*. By W. Main. Pp. 162. (Paris: Gauthier-Villars, 1913.) Price 2.50 fr.
- (4) *Ausführung qualitativer Analysen*. By Wilhelm Bilz. Pp. xi+139. (Leipzig: Akademische Verlagsgesellschaft m.b.H., 1913.)

(1) **T**HIS work fulfils in a very satisfactory manner the author's attempt "to fill a gap between the elementary text-books of organic chemistry and the numerous technical treatises and monographs of a highly specialised character." The opening chapter on the chemistry of the hydrocarbons and their derivatives will facilitate the reading of later sections by those not very conversant with organic chemistry, but, in the interest of these readers, exception must be taken to the use of the expression "rests," in reference to unsaturated groups or complexes (pp. 14-15). The adoption of this Germanism is quite unwarranted, inasmuch as the idea can